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ACCIDENTS IN TENNESSEE COAL MINES, 1891-1940

BY

FRANK E. CASH AND CLAUD P. DEMPSEY

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ACCIDENTS IN TENNESSEE COAL MINES, 1891-1940 1/

By Frank E. Cash 2/ and Claud P. Dempsey 3/

INTRODUCTION

The Southern Appalachian coal field extends southwest and northeast across Tennessee in a belt about 50 miles wide between the middle and eastern sections of the State. The earliest record of production of coal in Tennessee was for 1840, and the first inspection laws were passed in 1881. In 1887 the legislature created the office of chief inspector; but little was done until 1891, when a new act gave added duties and powers to the Tennessee Division of Mines.

Data for the tables in this report were taken from the annual reports (published and unpublished) of the Tennessee Division of Mines and the Southern Appalachian Coal Operators' Association and from the publications of the Federal Bureau of Mines, which has maintained a Safety Station at Jellico, Tenn., since 1911. The Tennessee Division of Mines, the Federal Bureau of Mines, and the operating companies and their employees cooperate in accident-prevention work.

This report combines the data in Information Circulars 6517 4/ and 6864 5/ and compares the accident experience in Tennessee coal mines with that of all coal mines in the United States. From 1891 to 1925 only fatality figures are available, but from 1925 to 1940 fatal- and compensable nonfatal-accident figures were compiled by the Tennessee Division of Mines.

ACKNOWLEDGMENTS

The State records were made available through the courtesy of the personnel of the Tennessee Division of Mines, and the data for the United States were obtained from Bureau of Mines publications by A. H. Fay, W. W. Adams, and others.

1/ The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from Bureau of Mines Information Circular 7167."

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4/ Humphrey, H. B., and Cash, F. E., Fatalities in Tennessee Coal Mines: Bureau of Mines Inf. Circ. 6517, 1931, 13 pp.

5/ Cash, Frank E., Accidents in Tennessee Coal Mines: Bureau of Mines Inf. Circ. 6864, 1935, 16 pp.

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FATALITY RATES

Table 1 gives the fatality rates in 10-year periods for Tennessee and from 1891 through 1939 for the United States. As complete data for 1940 are not available, the rates for that year are estimated in part. Deaths per million tons mined are an economic or cost factor that depends largely on efficiency of mining methods and labor as well as on favorable natural conditions. Fatalities per million man-hours of exposure are a gage of the safety of the worker while at his work and are probably the fairest basis for comparing accidents between different fields and different industries, provided this exposure and other attendant data are complete and strictly comparable from mine to mine and coal field to coal field. Major disasters in Tennessee coal mines in 1895, 1901, 1911, and 1926 were responsible for the high rates in those years.

TABLE 1. - Fatality rates in Tennessee and the United States since 1891, by 10-year periods, according to State and Federal statistics

Period	Killed, per million tons		Killed, per million man-hours	
	United States	Tennessee	United States	Tennessee
1891-1899	5.59	7.31	1.70	1.47
1900-1909	5.78	9.35	2.03	2.24
1910-1919	4.53	5.40	1.75	1.53
1920-1929	3.83	4.23	1.83	1.56
1930-1939	3.00	3.91	1.87	1.79
1891-1939	4.35	6.04	1.98	1.72
1940	2.82	3.67	1.83	1.79

Table 2 gives the tonnage mined and men killed in the United States and Tennessee for 10-year periods from 1891 through 1940. Tonnages for 1940 are estimated.

The true measure of the hazard to the miner (number of men killed per million man-hours of exposure) shows a slightly lower average for Tennessee than for the United States, except for 1900-1909, when some of the worst disasters occurred. On the other hand, from the economic standpoint, upon the basis of tons mined per man killed, Tennessee has a much higher rate than the United States.

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TABLE 2. - Coal mined per man killed, United States and Tennessee, by 10-year periods

Period	Coal mined, tons		Men killed		Tons per man killed	
	United States	Tennessee	United States	Tennessee	United States	Tennessee
1891–1899	1,700,000,000	23,497,351	9,381	171	182,000	137,411
1900–1909	3,696,000,000	52,635,330	21,391	492	173,000	107,004
1910–1919	5,621,300,000	62,917,095	25,229	338	223,000	186,145
1920–1929	5,873,746,575	56,223,146	22,488	237	261,660	237,250
1930–1939	4,396,327,049	45,026,382	13,203	177	322,979	254,387
1891–1939	21,287,373,624	240,305,304	91,692	1,415	232,163	169,827
1940	1/503,331,000	1/6,000,000	1/1,418	22	354,958	272,727

1/ Estimated.

PRODUCTION, EMPLOYMENT, AND ACCIDENTS, TENNESSEE COAL MINES, 1915–40

Table 3 gives the production and accident figures by years and by 5-year periods from 1925 through 1940. Included are fatalities and compensable nonfatal injuries. A compensable accident in Tennessee is one that causes the loss of more than 7 days' time.

During the 16 years production ranged from 3 1/2 to 6 million tons per year, the number of mines from 75 to more than 300, and the number of men employed from 6,827 to 10,353. The number of fatalities ranged from 9 in 1932, with 3,537,882 tons of coal mined, to 50 in 1926 (27 died in one explosion), with 5,788,741 tons of coal mined. Fatality rates per million tons ranged from 8.64 in 1926 to 2.54 in 1932, and the rate per million man-hours of exposure from 3.33 in 1926 to 0.97 in 1932.

ACCIDENTS, BY CAUSES

Table 4 gives the causes of fatal and compensable nonfatal accidents in Tennessee by years, including totals for 1935–40. Falls of rock and coal were responsible for the greatest number of fatalities, with haulage second, electricity third, machinery fourth, and explosives fifth. The causes of compensable nonfatal accidents, according to frequency, were falls of rock and coal first, haulage second, moving mine cars by hand third, handling material fourth, and flying objects fifth.

INVESTIGATION OF ACCIDENTS

Fatal accidents and some of the more serious nonfatal accidents were investigated by the Tennessee Division of Mines; although not thorough or complete, the reports suggested causes of and responsibility for the fatal accidents.

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TABLE 3. - Production, number of employees, and accidents in Tennessee Coal mines, 1925-40

Year	Production	Mines	Days Active	Employees	Fatal accidents	Compensable nonfatal accidents	Fatality rate per million tons	Fatality rate per million man-hours	Tons per fatality
1925	5,454,011	132	211	8,314	26	174	4.77	1.82	209,770
1926	5,788,741	133	234	7,948	50	232	8.64	3.33	115,775
1927	5,783,367	111	235	7,691	17	194	2.94	1.15	340,139
1928	5,610,959	116	226	7,849	18	155	3.21	1.24	311,719
1929	5,405,464	81	228	7,619	20	121	3.70	1.40	270,273
Average, 1925-29	5,608,508	155	225	7,884	26.2	177.2	4.65	1.79	214,065
1930	5,130,428	79	196	7,535	22	131	4.29	1.82	233,201
1931	4,721,548	83	179	7,448	17	265	3.60	1.56	277,738
1932	3,537,882	75	148	6,827	9	134	2.54	.97	393,098
1933	3,709,405	119	130	6,742	14	252	3.78	2.28	264,958
1934	4,104,910	134	137	7,019	21	323	5.11	1.92	195,472
Average, 1930-34	4,250,835	98	158	7,114	16.6	221.0	3.86	1.71	255,472
1935	4,164,586	128	151	7,287	16	258	3.84	1.27	260,287
1936	4,908,059	144	141	7,751	19	263	3.87	1.88	258,319
1937	5,096,446	220	141	10,353	22	389	4.32	1.96	231,658
1938	4,472,403	200	146	8,266	21	175	4.69	2.47	212,972
1939	5,180,715	170	193	7,977	16	118	3.09	1.81	323,795
Average, 1935-39	4,764,442	172	154	8,327	18.8	240.6	3.96	1.83	253,429
1940 1/	6,000,000	319	175	10,000	22	100	3.67	1.79	272,727

1/ Estimated tonnage and men employed.

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TABLE 4. - Fatal and compensable nonfatal accidents, by causes, 1935-40

Cause	1935		1936		1937		1938		1939		1940		Total	
	Fatal	Non-fatal	Fatal	Non-fatal	Fatal	Non-fatal	Fatal	Non-fatal	Fatal	Non-fatal	Fatal	Non-fatal	Fatal	Non-fatal
Falls of rock and coal	13	65	11	63	11	89	13	51	13	39	9	36	70	343
Haulage	2	50	6	48	7	59	1	21	1	33	9	4	26	215
Machinery	0	24	0	22	1	35	1	19	1	5	1	18	4	123
Electricity	0	1	1	3	0	4	2	5	0	1	1	0	4	14
Explosives	1	5	1	6	1	5	0	2	0	1	0	2	3	21
Falling persons	0	7	0	4	0	14	1	6	1	3	0	2	2	36
Gas ignitions	0	0	0	0	1	2	0	2	0	1	1	0	2	5
Mine cars	0	51	0	52	0	75	1	22	0	5	0	20	1	225
Handling material	0	26	0	28	1	58	0	24	0	11	0	12	1	159
Flying objects	0	13	0	17	0	15	0	9	0	9	0	2	0	65
Tools	0	8	0	9	0	22	0	5	0	2	0	0	0	46
Striking objects	0	6	0	2	0	6	0	3	0	2	0	2	0	21
Carbide gas burns	0	1	0	5	0	2	0	0	0	0	0	0	0	8
Miscellaneous	0	1	0	4	0	3	0	6	0	6	1	2	1	22
Total	16	258	19	263	22	389	19	175	16	118	22	100	114	1303
Surface (included in above)	1	17	1	16	2	17	1	13	1	2	1	2	7	67

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Fatalities from falls of rock and coal were distributed as follows: Improper or inadequate timbering, 29; inexperience and improper supervision, 13; failure to examine, take down, or timber roof properly, 12; failure to examine, scale, and timber haulageways, 11; improper supervision, 2; and inexperience, 3. The responsibility for these 70 fatal accidents was placed as follows: On foreman and deceased, 33; on deceased, 15; on foreman, 9; on foreman, deceased, and fellow workman, 6; on deceased and fellow workman, 4; and on company, 3.

Haulage was responsible for 26 fatalities distributed as follows: Wrecked trips, 5; wrecked trips (pushed), 2; fell off locomotive, 3; insufficient clearance, 3; flying switches, 2; jumping on moving trips, 2; handling mine cars, 2; insecure trestles, 2; and riding on top locomotive, blocking car insecurely, falling under moving trip, and similar accidents accounted for the others. Responsibility for the haulage fatalities was placed as follows: On company, foreman, and deceased, 8; on company, 6; on foreman and deceased, 5; on company and deceased, 3; on deceased, 3; and on deceased and fellow workman, 1.

Machinery caused 4 fatalities, as follows: Improper guarding, 2; insufficient clearance, 1; and undetermined, 1. Responsibility for the 4 machinery accidents was placed as follows: On company and deceased, 3; on deceased, 1.

Electricity caused 4 fatalities, as follows: Low and unshielded trolley wire, 3; and grounded locomotive, 1. Responsibility for the electrical fatalities was placed as follows: On company and deceased, 2; on company, 1.

Explosives caused 3 fatalities, as follows: Improper handling of detonators, 2; and digging into failed shot, 1. Responsibility for the explosives fatalities was placed as follows: On deceased, 2; on company, foreman, and deceased, 1.

Gas ignitions caused by an open light and by a lighted match resulted in 1 fatality each. Responsibility for the gas-ignition fatalities was placed as follows: On company, 1; on company and foreman, 1.

Falls of persons resulted in 2 fatalities: Fall from tipple, 1; and fall over cliff, 1. Responsibility for 1 of these fatalities was placed on the deceased and 1 on the company.

Asphyxiation from locomotive exhaust gas caused 1 fatality, responsibility for which was placed on the company. Responsibility for the 114 fatal accidents was placed as follows: On foreman and deceased, 38; on deceased, 22; on company and deceased, 10; on company, foreman, and deceased, 10; on company, 9; on foreman, 9; on deceased and fellow worker, 6; on foreman, deceased, and fellow worker, 6; and on foreman and company, 4.

ACCIDENTS, BY OCCUPATIONS

Fatal and compensable nonfatal accidents, by occupations, are given in table 5 for 1935 to 1940, inclusive. Similar figures were not available for previous years.

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TABLE 5. - Fatal and compensable nonfatal accidents, by occupations, 1935-40

Occupation	1935		1936		1937		1938		1939		1940		Total	
	Fatal	Non-fatal	Fatal	Non-fatal	Fatal	Non-fatal	Fatal	Non-fatal	Fatal	Non-fatal	Fatal	Non-fatal	Fatal	Non-fatal
Miners and loaders..	13	163	11	183	11	273	13	120	11	66	11	54	70	859
Trip riders	2	25	4	19	2	28	1	11	1	14	2	10	12	107
Motormen	0	12	1	8	2	7	0	1	0	0	4	2	7	30
Machine helpers	0	13	0	1	3	3	1	0	1	0	2	2	7	19
Tipplemen	1	5	1	6	0	6	1	8	0	2	1	0	4	27
Machine runners	0	9	0	15	1	23	2	15	0	9	0	12	3	83
Pumpers	0	0	0	0	1	1	0	0	1	0	1	0	3	1
Laborers	0	16	0	7	1	24	0	8	1	23	0	8	2	86
Trackmen	0	5	1	4	0	12	0	5	1	0	0	2	2	28
Timbermen	0	0	1	2	1	1	0	1	0	0	0	4	2	8
Foremen	0	2	0	3	0	1	1	1	0	0	0	2	1	9
Drillmen	0	4	0	0	0	2	0	0	0	1	1	0	1	7
Drivers	0	1	0	4	0	3	0	3	0	0	0	0	0	11
Mechanics	0	2	0	3	0	1	0	0	0	2	0	0	0	8
Bratticemen	0	1	0	0	0	0	0	1	0	0	0	4	0	6
Blacksmiths	0	0	0	2	0	2	0	0	0	0	0	0	0	4
Electric wiremen ...	0	0	0	2	0	0	0	1	0	0	0	0	0	3
Yardmen	0	0	0	0	0	2	0	0	0	1	0	0	0	3
Engineers	0	0	0	2	0	0	0	0	0	0	0	0	0	2
Shotfirers	0	0	0	1	0	0	0	0	0	0	0	0	0	1
Fire bosses	0	0	0	1	0	0	0	0	0	0	0	0	0	1
Total	16	258	19	263	22	389	19	175	16	118	22	100	114	1303

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Miners or loaders (employed in greatest numbers) have the highest accident rate as a class. Of the 114 fatal and 1,303 nonfatal accidents, miners and loaders suffered most, with 70 fatalities and 859 compensable lost-time accidents; trip riders or couplers were next, with 12 fatal and 107 lost-time accidents; motormen were third, with 7 fatal and 30 lost-time accidents; and machine helpers were fourth, with 7 fatal and 19 compensable lost-time accidents.

SUMMARY

The fatal- and nonfatal-accident rates for Tennessee coal mines are better than the average for the United States. This is no excuse for failure to improve the accident experience or for allowing it to be worse in the 10-year period 1930 to 1939 than in the previous decade. Compared with other mining States, natural conditions in Tennessee favor safe mining for the following reasons: Few mines liberate explosive gases; virtually all coal mined is above water level, and little pumping is required; the average coal cover is not excessive, allowing a high percentage of recovery at relatively low cost for roof support; in general, the coal beds are relatively thin, a condition that in itself tends to minimize accident occurrence; and, with exceptions, roof conditions are fair to good.

CONCLUSIONS

Reduction of accidents or improvement in accident experience can be realized in Tennessee coal mines by closer cooperation between operators, miners, and the State Division of Mines.

The operators should operate their mines as efficiently as possible - that is upon a safe operating basis. They should formulate safety and operating rules and provide the supervisory force necessary to enforce such rules and regulations and train employees to be careful and efficient.

Employees should exert every possible effort to reduce accidents by conforming to the safety and operating rules and availing themselves of all possible training through first-aid, mine rescue, and accident-prevention courses and regular attendance at safety meetings, which will enable them to become safer workers.

The Tennessee Division of Mines, Department of Labor, should employ enough competent inspectors to examine all mines in the State thoroughly and completely at least once every 60 days and to report such inspections to the chief of the division of mines, who should forward copies of such reports with his recommendations to the operating heads of the companies and to superintendents and mine foremen. Compliance with these recommendations should be checked on later inspections. The division of mines should investigate each fatal and serious accident as soon as practicable after its occurrence and send to the operating head of the company and superintendent or mine foreman of the mine concerned a report placing the responsibility and recommending ways of preventing similar accidents. It

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is desirable that there be close cooperation of those engaged in the mining of Tennessee's coal with the workers of the Federal Bureau of Mines, so that the mining people of Tennessee may receive and take prompt and effective advantage of the comprehensive information obtained by the Nation-wide activities of that agency.

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